

**MINISTRY OF PUBLIC WORKS AND WATER
RESOURCES**

**NEW ESNA BARRAGE
AND
POWER PLANT PROJECT**



**FINAL SUMMERY REPORT
OF
NEW ESNA BARRAGE AND POWER PLANT PROJECT**

**FROM
THE ENGINEERING DESIGN
&
IRRIGATION PROJECTS CONSULTING OFFICE
EDIPCO**

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Summary Report Of
New Esna Barrage & Power Plant Project
Civil Works

1- ABBREVIATIONS

The following abbreviations have been used in the Summary Report:-

Contract Agreement	C.A
Bill of Quantities	B.O.Q
Variation Order	V.O
Engineering Design & Irrigation Projects	
Consulting Office	EDIPCO
Ministry of Public Works & Water Resources	M.P.W & W.R
European Consortium For Esna Barrage	EUROCEB
Egyptian Cement Office	E.C.O
Engineer	Eng.
Engineer's Representative	Eng. Rep.
Extension of Time	E.O.T
Permanent Diaphragm Wall	P.D.W
Temporary Diaphragm Wall	T.D.W
UP Stream	U.S
Down Stream	D.S
Navigation Lock	N.L
Power House	P.H
Spillway	S.W
Closure Dam	Cl.D
Civil Work	C.W

Electromechanical Work	E.M.W
Electric Power Systems Company	E.P.S
Certificate of Completion	C.O.C
Maintenance Period Certificate	M.P.C
Contract General Conditions	C.G.C
Contract Special Conditions	C.S.C
Generating Units	G.U
Hydro Power Plants Executive Authority	H.P.P.E.A
Electroconsult Milan Italy	ELC

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Summary Report of
New Esna Barrage & Power Plant Project
Civil Works

2- Introduction

2-1 The Contract

In response to the Employer's invitation to international Tenderers to submit bids for the execution of the New Esna Barrage and Power Project, the Contractor submitted his Tender on 22.12.86.

After prolonged negotiations between the Employer and the Contractor and having reached various mutual agreements, the offer of the Consortium of Contractors referred to as EUROCEB was accepted by the Employer through his letter of Acceptance dated 28.06.88.

Further negotiations were held in order to resolve the outstanding matters, after which the Contract was definitively signed on 2.3.89 between the Ministry of Public Work & Water Resources and EUROCEB i.e more than two years later than the date of Tender submission.

The Contract documents are defined by the following :.

- i) Contract Agreement and its Annexes, No. s 1 to 7.
- ii) Appendix to the Contract Agreement containing texts of agreed subjects arising from the pre-award and Contract preparation meetings.

- iii) Volume 1 Part 11 of the Conditions of Contract
(Conditions of Particular Application).
- iv) Volume 1 Part 1 of the Conditions of Contract
(General Conditions).
- v) Technical Specifications.
- vi) Technical Data Sheets.
- vii) Drawings.
- viii) Bill of Quantities.
- ix) Contractor's Offer and Employer's letter of
Acceptance.

Article 1 of the Contract Agreement establishes that, in the event of ambiguities or discrepancies between the Contract documents, the order of precedence of the documents is according to the ranking indicated above.

The Conditions of Contract (General & Particular) derive from the F.I.D.I.C Conditions of Contract for Civil Engineering Works, 3rd Editions, 1977. ★

2-2 The Purpose of the Contract

The Contract is for the design, construction of Civil works, supply and erection of electromechanical works, commissioning and maintenance of the works, the precise scope of which is defined in Art. 3 of the Contract Agreement.

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2-3 The Initial Contract Price

In accordance with Art. 5 of the Contract Agreement and Clause 1. (1) (g). (1) of the Conditions of Particular Application, the initial Contract Price was.

Act. Curr.		Equiv. US \$	% Total Works
Egyptian Pounds	84860340	61779513.69	33.11
US Dollars	97946276	97946276	52.50
Aus. Shillings	127402367	9023994.24	4.84
Italian Liras	24644000000	17818997.06	9.55
Total (Equiv. US \$) 186568780.90			

Austrian Shillings portion represents the amount payable to Elin, the designated subcontractor for part of the electromechanical works.

The currency conversion into equiv. US Dollars is made at the exchanges rates ruling on 22.12.1986, the date of Tender submission.

i.e :

US \$ 1.0 =	Egyptian Pounds	1.3736
Us \$ 1.0 =	Italian Liras	1383.018355
Us \$ 1.0 =	Austrian Sh.	14.11817911

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The amount payable to the Contractor is based upon the unit rates entered in the Bill of Quantities applied to the actual quantities of work progressively carried out and certified under each item plus certain other Lump sum amounts specified in the B.O.Qts.

The Italian liras component of the initial contract price corresponds to a grant of the same value provided by the Italian Government who also provided Soft Loan facilities amounting to USD 94283666 in order to finance the U.S.D component.

The Civil Works component (IMPREGILO and COGEFAR – IMPRESIT) of the initial Contract Price was valued as follows :-

Act. Curr.		Equiv. US \$	% Civil Works
Egyptian Pounds	67168265	48899436.79	50.31
US Dollars	39241727	39241727	40.37
Italian Liras	12523512459	9055203	9.32

(which represents 52.10% of the initial Contract price)

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Final Measurement Amounts of Civil Works are finally valued as follows :-

Egyptian Pounds		USA Dollar
Total Bills (From B.O.Q 1 to 25)	65518894.310	41232776.48
Total Bills (30 Claims)	43284.000	50338.00
Total V. Orders	8526032.470	4405951.80
Day Work	15803.380	4586.43
Change of Law Invoices	15283235.662	
Total	89387249.822	45693652.71

- Considering the exchanges rates at the Tender Submission on 22/12/86 (U.S \$ 1.0 = Egyptian Pounds 1.3736), the total equivalent in \$ = 110.768818 million.
- Contract Price at same time \$ = 97.196366 million.
- The Ratio = 1.14, thus the increase is 14% which is a very reasonable ratio.

2-4 The Administration Of The Contract

Initially as no Engineer had been appointed, the supervision of the works was carried out directly by the Employer. Subsequently, by letter no. 410 dated 04/09/89, the Employer advised the Contractor that EDIPCO, EPS& SOGREAH had been appointed to provide engineering services for the Contract. By its Letter dated 06/05/90, EDIPCO advised the Contractor that the Engineer representative on site Mohamed Abdel El Meguid Osman had been delegated the full authority of the Engineer as being empowered and stated in the Contract Documents and this appointment had been effective as from 15/10/1989.

2-5 The Water Management System

New Esna Barrage is hydraulically designed so that the River Nile water discharges at a constant Up Stream water level of (79.0 m) will be flowing through the mouths of the six turbines in the Powerhouse and the eleven radial gates in the Spillway. When the whole numbers of the turbines are operated, the major quantity of the discharges will be passing from the turbines except for that of some minor discharges will be passing through the vents of the Spillway to keep the U.S water level constant at (79.0 m) without high fluctuations. When all the 6 Turbines are stopped, the whole quantity of the discharges will

be passing through the Spillway eleven radial gates and it may be required to adjust the flape gates (no. 1&11) to keep the U.S water level constant at (79.0 m). In case the Power station 6 turbines are partially operated (part working & the others stopped) the River Nile water discharges will be passing partially thr' the Power station and the Spillway.

The Spillway (11 no.) Radial gates are opened or closed depending on and together with the operation of the six generating units. And as well the vents of S.W radial gates are opened or closed in groups or single in paralleled or sequentially- according a certain computerized water Management System specified and detailed by the EUROCEB and previously accepted and approved by the Engineer & the Employer.

The Openings and close of the S.W radial gates in compliance with this kind of water Management system are controlled from the Central Computer Control Room in the Power house.

In case of facing any problem in the performance of the program of the computerized water management system, the Spillway radial gates could be operated locally by an electrical winches available in each vent of the Spillway.

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New Esna Barrage is the only barrage having this kind of water management system along the River Nile from Aswan to North Delta and special care and attention should be given to this system to assure operating the Spillway without any hydraulic problems.

3- The Major Components Of The Project Are

- 3-1 Temporary Cofferdam and Dewatering represented by bill of Quantity no. 3 finally amounted L.E 2622552.84 & \$ 3046113.06 .
- 3-2 Earthworks and Protections represented by B.O.Qt no.4 finally amounted L.E 17030497.69 & \$ 5702414.44 .
- 3-3 Roads and Tracks represented by B.O.Qt no.5 finally amounted L.E 501364.77 & \$ 434018.46 .
- 3-4 Navigation Lock including Guide Walls, Wing Walls and connecting structure with Power Plant. Represented by B.O.Qt no.6 finally amounted L.E 10053670.19 & \$ 8330045.15 .
- 3-5 Power Plant including Assembly bay, Dividing Walls and Connecting Structure with Spillway represented by B.O.Qt no.7 finally amounted L.E 15559435.23 & \$ 12266108.56 .
- 3-6 Spillway and connecting structures between Spillway and Closure Dam represented by B.O.Qt no.8 finally amounted L.E 9635986.33 & \$ 7535266.52 .

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- 3-7 Closure Dam represented by Variation Order no. 15 finally amounted L.E 5623969.43 & \$ 3739522.76 .
- 3-8 Permanent Diaphragm Wall represented by B.O.Qt no.10 finally amounted L.E 3203177.43 & \$ 2669478.89 .
- 3-9 Monitoring represented by B.O.Qt item no.12 finally amounted L.E 310357.85 & \$ 361823.19 .
- 3-10 Buildings (Administration Building, Store house & workshops) represented by B.O.Qt no.13 finally amounted L.E 369869.00 & \$ 58828.00 .
- 3-11 Housing for Employer and Engineer represented by B.O.Qt no.25 finally amounted L.E 4422974.00 & \$ 710620.00 .

4- The Substantial Completion of Works :-

- 4-1 The works of the temporary Cofferdam and Dewatering had substantially completed on 15/01/1994 and the Certificate of Completion issued under the Engineer covering letter No. EU/E/60/1995 dated 23/09/1995.
- 4-2 The works of the Earthworks and protections had substantially completed on 15/01/1994 and the C.O.C issued under the Engineer Covering letter No. EU/E/60/1995 dated 23/09/1995.
- 4-3 The Works of the Roads and Tracks had substantially completed on 15/01/1994 and C.O.C issued under the Engineer Covering letter No. EU/E/60/1995 dated 23/09/1995.
- 4-4 The Works of Navigation Lock including Guide Walls, Wing Walls and connecting structures with Powerhouse Plant had substantially completed on 15/01/1994 and C.O.C issued under

the Engineer Covering letter No. EU/E/72/1994 dated 21/02/1994.

- 4-5 The Works of the Power Plant including Assembly Bay, Dividing Walls and connecting structures with Spillway had substantially completed on 02/09/1995 and C.O.C issued under the Engineer Covering letter No. EU/E/60/1995 dated 23/09/1995.
- 4-6 The Works of the Spillway and connecting structures between Spillway and Closure Dam has substantially completed on 27/12/1995 and C.O.C issued under the Engineer Covering letter No. EU/E/106/1996 dated 13/06/1996.
- 4-7 The Works of the Closure Dam had substantially completed on 15/01/1994 and C.O.C issued under the Engineer Covering letter No. EU/E/132/1994 dated 02/05/1994.
- 4-8 The Works of the Permanent Diaphragm wall had substantially completed on 15/01/1994.
- 4-9 The Works of the Monitoring had substantially completed on 15/01/1994 and C.O.C issued under the Engineer Covering letter No. EU/E/60/1995 dated 23/09/1995.
- 4-10 The Works of Buildings (Administration building, store houses & workshops) had substantially completed on 15/01/1994 and C.O.C issued under the Engineer covering letter No. EU/E/180/1994 dated 01/08/1994.
- 4-11 The Works of Housing for Employer and Engineer had substantially completed on :-

Type 1	2 No.s	On	06/08/1990
Type 11	12 No.s	On	01/03/1990

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	3 No.s	On	12/08/1990
	2 No.s	On	13/10/1990
	1 No.s	On	16/10/1990
Type 111	3 No.s	On	05/09/1990
	3 No.s	On	08/09/1990
	1 No.s	On	16/10/1990
	3 No.s	On	21/10/1990
	2 No.s	On	03/11/1990
	2 No.s	On	18/11/1990
Guest houses	2 No.s	On	16/12/1990
Office of Employer & Engineer	1 building	On	01/03/1990
and C.O.C issued under the Engineer Covering letter No. EU/E/152/1992 dated 09/02/1992.			

5- Maintenance Periods

- 5-1 The Temporary Cofferdam and Dewatering Maintenance Period had completed on 18/01/1997 and the maintenance period certificate issued under the Engineer covering letter no. EU/E/166/97 dated 12/06/1997.
- 5-2 The Earthworks and Protection maintenance period had completed on 18/01/1997 and the M.P.C issued under the Engineer covering letter no. EU/E/166/97 dated 12/06/1997.
- 5-3 The Roads and Tracks maintenance period had completed on 18/01/1997 and the M.P.C issued under the Engineer covering letter no. EU/E/166/97 dated 12/06/1997.

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- 5-4 The Navigation Lock including Guide Walls, Wing Walls and connecting structures with Power Plant maintenance period completed on 16/12/1996 and the M.P.C issued under the Engineer covering letter no. EU/E/178/97 dated 01/11/1997.
- 5-5 The Power Plant including Assembly Bay, Dividing Walls and connecting structure with spillway maintenance period completed on 29/03/1998 and the M.P.C issued under the Engineer covering letter no. EU/E/434/98 dated 26/03/1998.
- 5-6 The Spillway and connecting structures between spillway and Closure Dam maintenance period completed on 27/12/1997 and the M.P.C issued under the Engineer covering letter no. EU/E/191/97 dated 26/01/1997.
- 5-7 The Closure Dam maintenance period completed on 15/01/1996 and the M.P.C issued under the Engineer covering letter no. EU/E/88/96 dated 06/03/1996.
- 5-8 The Permanent Diaphragm Wall maintenance period completed on 15/01/1996 and the M.P.C issued under the Engineer covering letter no. EU/E/88/96 dated 06/03/1996.
- 5-9 The Monitoring maintenance period completed together with the Power Plant and spillway and its M.P.C is within their certificates having the same dates and Engineer covering letter.
- 5-10 The Building (Administration, store houses and workshops) maintenance period completed on 15/01/96 and the M.P.C issued under the Engineer covering letter no. 112 dated 30/07/96.

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5-11 Housing for Employer and Engineer maintenance period completed on 15/01/96 and the M.P.C issued under the Engineer covering letter no. 105/96 dated 12/06/96.

5-12 Maintenance Period Certificates Still Unissued.

The maintenance period certificates of the whole civil and electromechanical works had been issued except for the following electromechanical sections :-

Section 18.211	Power Plant U.S stop logs, corrosion protection paint has not yet been done.
Section 18.215	Power Plant temporary stop logs, corrosion protection paint has not yet been performed.
Section 18.351	P.P D/S Bulkhead Gates, corrosion protection paint has not yet been executed.
Section 15.590	Ventilation and air conditioning, HPPEA reserves comments in this section.
Section 20100	132 KV Main Transformer No.3, HPPEA reserves comments in this section.
Section 16901	Power Plant Control System HPPEA reserves comments in this section.
Section 16612	Power Plant Standby Diesel Generators, its maintenance period extended up to 1/9/98.
Spillway :-	
Section 18.212	Spillway D.S stoplogs, corrosion protection paint has not yet been executed.

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Section 18.221	Spillway U.S stoplogs, corrosion protection paint has not been made.
Section 14.360&18.411	Chain Winches & Radial gate no.1. adjustment of electrical drawer & corrosion protection paint has not been executed.
Section 14.360&18.411	Chain Winches & Radial gate no. 2. the delivery of 2 pcs time relay & corrosion protection not done.
Section 14.360&18.411	Chain Winches & Radial gate no.11(flape) adjustment for the electrical drawer, supply of one position indicator & corrosion protection not performed.
Section 14.360&18.411	Chain Winches & Radial gate no.3,4,5,6,7,8,9,10. Corrosion protection not performed.

5-13 Generating Units-Period of Maintenance

The New Esna Barrage Power Plant Project consists of 6 (Six) Generating Units. The reliability tests (satisfactory continuous running of a 30 day period) for each Unit had been completed on the following dates :-

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Unit No. 1	18/01/1994
Unit No.2	04/12/1993
Unit No.3	15/01/1994
Unit No.4	01/12/1993
Unit No.5	01/12/1993
Unit No.6	02/01/1994

The Engineer & the Employer refused to take over because of the observed abnormal vibrations on the units resulting from the changes of the hydraulic transient condition inside the draft tubes.

EUROCEB studied this phenomena and proposed the Solution of an air admission system which was completely installed and tested by the end of July 1994.

In many positions in the Conditions of Contract it has been mentioned that the spare parts and tools shall be delivered before the issuance of the C.O.C of the first unit. These spare parts had been including the insulator washing machine and telescopic cars and all were representing about 50% of the total contract value for spare parts and tools and accordingly the Engineer and Employer had informed the Contractor that it was only possible to release the C.O.Cs of the Generating units after the settlement of this issue.

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On 04/08/1994 a meeting presided by the Minister of MPW/WR/, held in his office and attended by the Engineer, Employer, HPPEA and EUROCEB representatives agreed together with other subjects that the commencement of the guaranteed period of the generating units could be 01/08/1994 but the EUROCEB refused to sign the minutes of this meeting.

On 21/09/1995 the Minister of MPW/WR sent his letter no. 1656 to the Ambassador of Italy stating the following :-

“ Your Excellency may notice from the minute of the meeting that in spite of Contract Agreements and rules which prevents the issuance of the C.O.C, specially the condition of supplying spare parts and tools but for the sake of good will and cooperation, we have approved to issue the C.O.C for the P.H as from 01/08/1994 before the supply of spare parts and tools. Hence the maintenance period for the P.H should start from the date of issuance the C.O.C.

Unfortunately, EUROCEB refused to sign the minutes of the meeting and sent their letter No. ME/94 dated 14/09/1994.

And as a result of that negative and uncooperative reply of EUROCEB and their refusal to sign the minutes of the meeting, the ministry is obliged to apply the conditions of the Contract Agreements and the C.O.C will be issued after supplying of all spare parts and tools

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required for work and obligation completions and satisfactions ”.

On 31/08/1995 EUROCEB had completed the supply of all the spare parts and tools required in the Contract.

On 02/09/1995 the Engineer & the Employer had issued the C.O.C of the generating units to start the maintenance period for four years ending on 01/09/1999.

EUROCEB requested that the C.O.C of the G. Units should be as from 01/08/1994 which is the testing and completion date of Air Injection Works of all the units. EUROCEB claimed not to accept the date of 02/09/1995.

On 28/7/1998 EUROCEB raised their request to the Minister of MPW/WR.

On 06/08/1998 the Executive Chairman of HPPEA has raised a memorandum in this regard to the Minister of Electricity and Energy who together with the Minister of MPW/WR both have approved that the C.O.C of the generating units should be 01/08/1994 to start the maintenance period for four years ending on 31/07/1998.

6- The Variation Orders

The following variation orders of thirty numbers had been issued during the construction period of the project to cover the whole work requirement of the different components of the project illustrated as follows. This was

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in application of clauses 51& 52 of general conditions of Contract.

V.o no	Description	Final Measurement Amount	
		L.E	\$
2	Analysis Assuit Cement	637.00	4140.74
2A	Temporary Access Bridge	93509.03	17522.86
3	Additional Cost Design		67000.00
4	Cut off Wall Spillway	335364.13	332196.76
5	Employer Office Timber ceiling	107106.44	
6	New item approved	1023410.65	80611.69
7	Control Tower Additions	6688.37	1063.82
9	Supply grout for key Trench	22469.71	14357.96
10	Precast Stairs	15137.10	5999.33
11	Reinforced Neoprene Bearing	15104.53	3862.98
12	Precast Slab Protection	98219.98	58991.12
14	Floor PVC Tiles	55502.84	2774.10
15	Alternative Solution for Closure Dam	5623969.43	3739522.76
17	Bollard for N.L	14696.40	
18	Admin. & Store / Workshop	2592.39	2568.81
19	Concrete Using O.P.C	134854.00	50416.30
20	Compact sewage Treatment Plant	177329.65	74.57

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V.o no	Description	Final Measurement Amount	
		L.E	\$
21	Fencing around N.L	82278.87	17516.05
23	The Addition of an asphalt base	321334.43	
24	Nine different items	71468.74	2712.45
25	Six different items	12671.88	4563.05
29	Purchase of Contractors Steelyard	193512.35	
30	Purchase of Contractor Materials	48446.99	
	Total	8526032.47	4405951.80

N.B Variation orders no. 1,8,13,16,22,27 & 28 had been for another different subjects and deleted.

7- Change Of Law Invoices

In application of Article 30 of Contract Agreement which states that if after the date of the Tender submission for this Contract (22/12/1986) and until its final completion there occur changes in and / or issue of new Laws, decrees, regulations, and /or decisions made by any Egyptian Official Authorities which can be shown to have caused an additional or reduced cost to the Contractor, in relation to Taxes, cement, steel, timber, oil

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products and electricity, the Contractor had been paid for the following items :-

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Ordinary Cement	Settled within the amicable Solution
White Cement (bagged)	1369.873
Cement Type 11	Settled within the amicable Solution
Steel grade 52	35022.22
Steel grade 37	381693.37
Steel grade 60	Settled within the amicable Solution
Structural steel	Settled within the amicable Solution
Timber	38652.07
Solar	3799832.14

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Benzene	888075.46
Oil Consumption	647993.47
Light Electricity	1062533.91
Power moving electricity	3361145.93
Stamp duties	Settled within the amicable Solution
Sales Tax	1216740.62

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8- Completed Outstanding Major Works

Among these works there had been :-

8-1 The Restitution Channel (River Nile) Reshaping Works .

(Scour Downstream Spillway and Powerhouse)

The pit run gravel filling works for reshaping the spillway Restitution Channel was Limited in the central part of the spillway restitution channel for a width of 130.0m. The extension of the filling from the end of existing rip-rap (protection Limit) to the D.S side was about 22m in the center and 35.0m in correspondence with the two scour depressions.

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The thickness of the filling in the upstream part of the protection Limit varied from 1.0m to 3.0m. In the D.S part was 0.5 except in correspondence with the two major depressions where it was about 2.0m.

The pit run gravel filling works for reshaping the restitution channel of the powerhouse consisted of reshaping the channel submerged slope situated immediately d/s the diaphragm wall and adjacent to the approach channel of the navigation lock and partial filling of the depression at the foot of this slope. The depression of elliptical shape was about 45 by 35m and the slope to be reshaped was about 80.0m long.

The observed scouring phenomena along the restitution channel were already predicted, although with different geometries, during the hydraulic model tests; the differences between model and as constructed works being related to the presence of the diaphragm wall of the cofferdam and to the as dredged levels.

The presence of the diaphragm, not tested in the model, on the one hand represents an additional safety factor for the overall stability of the structure but on the other hand induces more localized scouring phenomena D.S the spillway rip-rap protection.

EDIPCO had considered some additional safety measures, consisting in localized reshaping and stabilizing of the unprotected river bed in the restitution channel, were to be confined in the areas which proved to have

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been more exposed to scouring phenomena after a full year's operation. i.e the transversal strip immediately d/s the Spillway rip-rap protection limit and the area d/s of the cofferdam diaphragm wall along the left side of the powerhouse restitution channel.

The above specified repair & remedial scour works had been executed by the Contractor (EUROCEB) on his own account to the satisfaction of the Engineer & the Employer.

8-2 Water Leakages in the Power House

Among the Outstanding Completed Works there had been the treatment of the water leakage flowing out from the expansion Joints and walls of the Powerhouse.

The water Leakage discharges were daily recorded, compiled and then analysed and submitted in a monthly report. These reports were showing that the actual water Leakage was normal as in all water projects and the quantity was less than expected. In the beginning of the water treatment by grouting, cement bentonite was used and then replaced by Rocagil BT whose technical data relating to the Rocagil BT acrylic material which the Contractor proposed to use for grouting in the area of the Leakage expansion Joints and the profile of the T.S.B company employed to execute these works had been accepted by the Engineer and approved by the Employer.

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T.S.B company has carried out many similar works in Egypt and is currently working on the Cairo Metro Project.

On the basis that the grouting satisfactorily stopped the Leakage, the Contractor replaced the 10 cm half round drainage channel and the external protective cover so that it would be possible to check for Leakage in the future. This job had been carried out to the satisfaction of the Engineer and Employer on the account of the Contractor (EUROCEB).

8-3 The grouting injection of the Draft Tube Liners of the Six Generating Units

The draft tube liners from inside had been inspected & tested by hammering on the walls by the staff of the Engineer and from the resulting sound it was easy to recognize that there had been voids and gaps in the back of some places between the wall of the draft tube liners and the surrounding reinforced concrete. In the upper half part of the tubes scaffolding had been used in this job.

The Contractor had been instructed to do the required grouting injection for that specified places having voids and gaps in each unit. The Engineer had accepted the use of Sika 52 material in this operation of grouting injection.

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The Contractor together with the Esna Barrage electrical Authority had arranged a program for stopping unit after the other till the inspection , testing and grouting injection had been completed satisfactory on the following dates :-

- On 11/6/97 the grouting injection of the 4th unit was completed.
- On 6/12/97 the grouting injection of the 5th unit was completed.
- On 4/1/98 the grouting injection of the 3rd unit was completed.
- On 26/1/98 the grouting injection of the 2nd unit was completed.
- On 21/2/98 the grouting injection of the 1st unit was completed.
- On 29/3/98 the grouting injection of the 6th unit was completed.

8-4 The Two Weed Clearance Machines

The electromechanical Contract documents were having a provision for the supply of one weed clearance machine. After operating this machine by some months, it was realized the deficiency of this machine because of the big flow of water weeds on and in front of the trash rack rakes of each unit during the different seasons of the year and in particular during summer.

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On 28/05/1996 a supply order for the purchase of another machine having the same capacity of the previous one with some modifications had been placed to the Egyptian Company for the International Trade and it brought the new machine as being specified to assist in performing the referred to duty, and to be as a reserve for the first one.

Unfortunately it had also proven that the two machines are together unable to cope with the weed clearance in summer and now the matter has become a dispute in spite of having 2 machines in addition to the efforts being made to clear water weeds continuously from the U.S of the Old Esna Barrage and it happens frequently and for long periods that these water weeds completely stops the operation of the turbines.

So, the Ministry of PW/WR together with the Ministry of electricity & power are searching for alternatives to assist in solving the problem as the continuous running of the turbines should be assured to guarantee the specified power from the project.

9- Outstanding Works The Corrosion Protection System

According to Tender Documents, volume 11 B, technical specifications (Divisions 14, 15, 17 & 18) the specification of corrosion protection system of.

- Section 14.060 covers the corrosion protection of equipment supplied under division 14-“ Handling equipment ”.
- Section 15.060 covers the corrosion protection of equipment supplied under division 15-“ Auxiliary mechanical equipment ”.
- Section 17.060 covers the corrosion protection of equipment supplied under division 17-“Generating units”.
- Section 18.060 covers the corrosion protection of equipment supplied under division 18-“ Gates, stoplogs and trash racks ”.

In respect of sections 14.060, 15.060 & 18.060 all the protection systems adopted shall have a guaranteed life of 8 years (6+2); the Contractor shall bear the cost of repainting work of.

- 100% of the protected area up to the end of the Sixth year.
- 75% of the protected area up to the end of the Seventh year.
- 50% of the protected area up to the end of the Eighth year.

In regard of section 17.060 all the protection systems adopted shall have a guaranteed life of 3 years (2+1) ; the Contractor shall bear the cost of repainting work of:-

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- 100% of the protected area up to the end of the Second year.
- 90% of the protected area up to the end of the third year.

The above all guarantees shall be certified by an official agency.

The protection systems will be considered as satisfactory if, at the end of their guaranteed life, the degree of surface deterioration is not more severe than the reference standards.

The reference standard, for the performance of the paint system is rust grade No. 4 of ASTM standard D 610.

The guaranteed life of the protective systems will be considered to commence from the date of issue of the Taking – over certificate by the Engineer.

The performance of the protective paintwork during the guaranteed life will be inspected in the presence of both the Contractor and the Employer.

Any necessary repair work shall be determined on the basis of the results of these inspections these inspections were supposed to be carried out jointly by the Employer and the Contractor at the following times calculated as from the date of commencement of the guarantee for sections 14.060, 15.060 and 18.060.

At the end of the first year (meets 1/8/1995).

At the end of the sixth year (meets 1/8/2000).

At the end of the seventh year (meets 1/8/2001).

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At the end of the eighth year (meets 1/8/2002).

And at the following time in respect of section 17.060.

At the end of the first year (meets 1/8/1995).

At the end of the second year (meets 1/8/1996).

At the end of the third year (meets 1/8/1997).

So, the real position now is that the first year inspection for sections 14.060, 15.060 & 18.060 had not been made by the Contractor and as well the first year, second year and third year inspection for section 17.060 had not been made by the Contractor and consequently No paint work of any kind of corrosion protection system has been executed according to the Contract Specification.

Within the amicable Solution discussions in the meetings held in this concern, it had been agreed with the EUROCEB that by the end of August 1998, the components of section 17.060 will be inspected to determine any necessary repair work and this inspection will be followed by a proper program to perform the paint system according to rust grade No. 4 of ASTM standard D 610.

Also, it has been agreed with EUROCEB that they would achieve the inspection program for sections 14.060, 15.060 & 18.060 one year earlier i.e.

At the end of the sixth year will meets 1/8/1999 .

At the end of the seventh year will meets 1/8/2000 .

At the end of the eighth year will meets 1/8/2001 .

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To confirm this, the Contractor will submit to the Employer a letter of bank guarantee bond amounting one million covering the cost of the whole above referred to work.

10- Completed Major Variations of Civil Works

10-1 The Closure Dam Alternative Solution

(Proposed & Submitted by the Contractor)

Among the completed major works of variations, there had been the construction of the Closure Dam alternative Solution.

Variation order no. 15 had been issued in this regard to replace B.O.Qt no. 9 (tender Solution) as being prescribed hereinafter :-

The Tender design concept for the Closure Dam was to form the embankment from the Nile river bed up to Elevation 75.0m using hydraulic sand filling (The percentage in weight passing ASTM sieve n°200 measured at the excavation or borrow area location will be less than 12%). The Contract made provision for the densification of this material by vibroflotation.

Successful densification of fill material by vibroflotation is to a large extent dependant on the nature of the material.

Thus coarse granular materials will produce satisfactory results but very fine and silty materials are not suitable.

Site investigations carried out prior to Tender provided soils information for preparation of the Tender documents.

However this information was considered incomplete and the Contract made provision for further site investigation to

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obtain the additional information required for the detailed design-data from this further site investigation.

Current soils data during excavation showed that the Nile river sand available for the hydraulic sand filling was rather fine and at the limit of acceptability for satisfactory vibroflotation. In fact, approximately half of the samples provided later were failing to comply with the requirements of the specification. Hence some relaxation of the specification would have been required if the Nile river sand were to be used.

Taking into account the known properties of the Nile river sand, namely that the " fineness " of the sand is generally only just within or even outside the limits defined in the specification (12%), the Contractor had proposed the use of alternative materials and zoning which in his view would result in a superior Solution for the Closure Dam in terms of safety and quality of construction.

The Contractor proposed that the center dense zone to be constructed with pit run sand and gravel from El Deir instead of the river sand. This alternative denser type of material did not require additional densification by vibroflotation and hence cut out any uncertainty associated with this process.

In the Contractor's view it would have been inadvisable to proceed with the construction of the Closure Dam utilising the available river sand.

In the above circumstances, the Contractor considered that he could not be held responsible for the detailed design in

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accordance with the Tender design or for the execution of such works at the present Contract rates and prices.

In addition, the Contractor could not be held responsible for any additional costs or increased time requirement that might be incurred in case of executing the Tender Solution.

After a thorough studies, discussions and meetings, the Engineer and the Employer informed the Contractor that both Solutions are acceptable and he has to choose the convenient Solution for him and in case he will choose the Solution proposed by him, the cost should be within the cost of the contract Solution without any extra expenses.

The Contractor had chosen his alternative Solution and carried out the job very successfully to the satisfaction of the Engineer and the Employer.

The cost of the Closure Dam basic Solution as being stated in the Contract is L.E 6445346 plus \$ 4195470.

The cost of the alternative Solution proposed by the Contractor as actually executed had amounted L.E 7559143 plus \$5016729.

The increased difference of L.E 1,113,797.0 & \$ 821,259 equivalent to L.E 3,906,077.0 had been recovered by the Employer by deducting this amount from the Contractor's dues in compliance with the provisions & conditions stated by the Engineer and the Employer that the alternative Solution should not by any mean exceeds that of the Contract basic costs and expenses.

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10-2 Navigation Lock Variations (Additional)

Among the N.L major completed works of variations, there had been :-

10-2-1 The extended length of the N.L to be 160m instead of 116 m providing recesses for the stoplogs at the front and behind each gate and as well the extending of the U.S guide wall length to be 100 m.

10-2-2 Raising the Bascule Bridge so that the clearance between the level of the lowest elevation of its main girder (the raised bottom of the bridge) and the maximum D.S water level (75.30 m) would be reaching 11.15 m to allow for navigation traffic from both directions, saving time, without opening the Bascule Bridge. The elevation of the road on the deck of Bascule Bridge had been maintained 88.50 m. The costs of the above works had been paid in an amount consistent with the pricing principles and criteria set out in the Contract for the performance of such extra works.

10-3 Temporary Diaphragm Wall & Dewatering System

The Contractor had carried out an additional geotechnical investigation in order to verify and where necessary to amplify data which was fundamental to the design of the works.

These investigation assured the presence of deep sandy layer underlying the stiff clay layer in the north western region

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of the T.D.W pass line, where the toe of the T.D.W was normally being embedded.

This sandy layer 10-15m deep was underlaid by a continuous stiff clay layer.

To cut off the water seepage the T.D.W had to be embedded in the lower stiff clay layer, i.e. about 40-54m depth.

The equipment's working on the site were not adequate to go down to this depth.

So the Contractor offered 3 alternatives to encounter this problem:

- New shipment of a hydro phrase machine capable to cross the upper clay layer till the lower one.
- To inject this sandy layer (the window) by a suitable injections.
- To construct number of deep wells to collect the seepage water passing through this window.

The last alternative was preferred by the contractor and accepted by the Engineer and Employer as a feasible Solution and to gain time.

The Contractor executed (20Nos) of deep wells in addition to the traditional wells for dewatering purpose, which operated successfully all the needed construction period.

The Engineer & the Employer did not recognise and consider the Contractor allegation that there had been significant differences were discovered to exist between the subsoil conditions described in the Tender documents and the sub-soil conditions found by the Contractor to exist on site which

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were pretended by the Contractor to be actually encountered during the performance of the works as the Special Consultant of EDIPCO Dr. Professor Abo Eleid had stated that the referred to material was hard silt and not hard stone.

The Contractor was unable to continue the construction of the T.D.W using the available equipment by this time because of the deep existence of this material at a depth reaching 54.0m. Because of that the Contractor submitted a proposed alternative Solution to complete the process of drying the site by the installment of deep wells (20No.s) instead of waiting the importation of new suitable equipment able to work at bigger depths reaching 2.00m below the deep top surface of the solid impervious region.

After prolonged and thorough discussions by the EUROCEB & EDIPCO special consultants, the Engineer and the Employer agreed to execute the proposed deep well Solution in addition to the shallow wells which were specified in the Contract. After that this alternative Solution had been executed satisfactorily and proved its successful results.

This temporary job had been carried out within the Contract rates and pricing and then the Contractor claimed for the cost of the executed Solution. The Engineer accepted part of this claim and the other part had been considered within the Amicable Solution.

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10-4 Powerhouse Water Circulation Preventive Walls

The reason behind the construction of these walls was that it had been observed that the turbines output at nominal load was below the guaranteed value and the cause for this decreased output had been identified to be the open bulkhead opening at the draft tube ceiling.

This created a disturbance of the draft tube flow which could easily be improved by interrupting the flow from tailrace into the drafttube bulkhead opening by the construction of turbine water circulation preventive walls for each.

The referred to walls were illustrated on the electromechanical drawings but they were missed to be shown on the Civil drawings by ELC (The designer of EUROCEB). The matter had been revised by the Engineer and then directed EUROCEB to prepare the design, the Civil drawings and the workshop drawings to be ready for construction as above mentioned.

These walls had been executed within the B.O.Qt no.7 (P.H) applying the same rates and prices. They had been reinforced concrete walls of 6 numbers with the dimentions of (11.3m) wide and (4.5m) height located at the draft tube ceiling. Their construction costed a total amount of (EP 31620.71) & (\$ 23690.29). The water tightness of the formworks had been carefully prepared in order to obtain, successful results for working in dry and it was agreed to make these formworks locally instead of its importation from Italy to avoid high costs and the delay of starting the work.

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11- Contract Period & Extension Of Time

11-1 Preface the Contract period was 50 months and the Engineer on 16/03/1991 (confirmed by the Employer on 17/03/1991) in response to the Contractor's request awarded:-

An extension of time of 3.3 months which was stated to compensate for all delays (design & construction) associated with the N.L variation plus.

A further extension of 4.2 months awarded in compensation of delays in U.S A Dollar payment drawn from the Italian Government Loan facilities in other words to compensate for " Delays in payment " and to be " Without changes to the Contract rates and lump sum amounts ".

The period 50 months + 3.3 months + 4.2 months was applicable on the Navigation Lock.

The period 50 months + 4.2 months was applicable on the whole other parts of the project.

11-2 Periods Of Delay

11-2-1 Navigation Lock

On the basis of above compared with the dates of the Certificates of completion, there had been no delay in respect of the navigation Lock.

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11-2-2 In regard of Closure Dam

The delay was 3 months, one week & one day. This delay was out of the Contractor's hand as he was obliged to complete the Closure Dam integrated with and sequent to the completion of the N.L (not in paralled). The delay did not affect the whole works and did not forbid the use of the project and consequently the application of penalties was not viewed.

11-2-3 Dredging :- No Delay

11-2-4 Powerhouse & it's Accessories :-

Part of the delay (6 months, one week & 4 days) was associated with the delay of Electromechanical works affecting the whole work and forbided the use of the project and the remaining part (16 months, 2 week & one day) of delay was because of the completion of the outstanding repair and remedial works. This component of the project (P.H) was subject to impose liquidated damages according to the Contract equivalent to 15% of the value of the P.H whose period of work delay had been more than 2 months and 4 weeks. This issue of Liquidated damages had been settled and solved within the amicable Solution between the Employer and the Contractor.

11-2-5 The Spillway and it's Accessories :-

The delay was because of the completion of the outstanding repair and remedial works and it did not

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affect the whole work & did not forbid the use of the project because it had allowed on 24/08/1993 to form and raise the up stream lake water levels to the project designed levels, the same as it had been stated and required by the Ministry by this time. Consequently it was not viewed to impose liquidated damages on the Contractor in this regard. No delay had been happening in respect of U.S & D.S stoplogs.

11-2-6 Other Items :-

In respect of the whole other items, the delay was because of the completion of the outstanding repair and remedial works and it did not affect the whole work & did not forbid the use of the project. Therefore the application of penalties was not viewed.

11-2-7 In respect of imposing Liquidated Damages on the whole electromechanical works, the issue had been settled and solved through the amicable Solution between the Employer and the Contractor.

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12- THE ARBITRATION

12-1 Preface

The Contract made provision for disputes to be resolved by an international arbitration to be held in Cairo and as represented by both Parties in the first session of the Tribunal on 18/02/1993, a dispute existed between the Parties concerning the correct procedure for the settlement of disputes to be followed under the Contract.

According to the Claimant (EUROCEB) firstly, Article 25 of the Contract Agreement entirely supersedes and replaces Clause 67 of the Conditions of Contract. Article 25 of the Contract Agreement provides that in the event of a dispute the Parties “ shall in the first place make every effort to resolve the matter amicably by direct in formal negotiation ” (ref. Art 25.1) in the event of failure to reach agreement on same the dispute may then be submitted to arbitration at any time selected by the Contractor and / or the Employer (without reference to the Engineer).

According to the Respondent, (the Ministry) Clause 67 is not over-ruled by Art. 25 and furthermore whenever the Engineer or even the Engineer's Representative intervenes, he intervenes also in the exercise of his role under Clause 67 and as a consequence most of the Claimant's Claims were rendered “ time barred ”. Clause 67 required the claiming party to firstly request the Engineer's Decision on the disputed matter and in the event of dissatisfaction with such decision the claiming party may then refer it to arbitration.



12-2 The Contractor's (EUROCEB) Claims & Disputes

- 12-2-1 The Contractor (EUROCEB) via his statement of claim dated 30 April 1993- chapter 1 – had alleged and pretended that the Employer had breached the Contract provisions for compensation of the Contractor in the event of delayed payment and he claimed for that in five cases.
- 12-2-2 Via chapter 2 of the referred to statement he alleged that the Employer breached the Contract provisions for reimbursement of the Contractor's Additional costs and he claimed for that in 7 cases.
- 12-2-3 In chapter 3 EUROCEB claimed for indirect and overhead costs on reimburseable amounts.
- 12-2-4 In chapter 4, he claimed for the reimbursement of the improper deductions from due amounts in three cases.
- 12-2-5 In chapter 5, the Contractor claimed to be reimbursed against the costs of the major variations in the Civil Works in five cases.
- 12-2-6 Through chapter 6, the Contractor requested for miscellaneous claims of Civil Works in three cases.
- 12-2-7 In chapter 7, he claimed for the cost of Cement resulting from the lack of the Employer responsibilities and the bad quality of cement used in the Temporary Diaphragm Wall.

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12-2-8 In the last chapter 8, the Contractor claimed his entitlement to extension of time and associated financial compensation in ten items.

The EUROCEB raised their claims to the arbitration tribunal who had directed the Employer to reply on the matter. Then the process and procedures of Arbitration had continued between the two parties (Contractor & Employer) once In Egypt and the other in London without any interruption.

The Contractor's Claims had amounted the following currencies :-

	L.E	U.S.D	LIT.	A:Sch.
Civil Works	87216207	13583511	2980940.151	
Elmec, Ansaldo	4000699	1543348	3840305.571	
Elin				11813039
Romenergo	287079	398791		
Total	91503985	15525650	6821245.722	11813039

With a Grand Total of approximately L.E 170 million.

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12-3 In this regard EUROCEB had submitted for Arbitration the request for the payment of the following amounts and as well the release of the guarantee bonds :-

12-3-1 Dues to the Contractor amounted L.E 45.50 million supported by official letters, bills invoices and payment certificates.

12-3-2 The above different claims amounting L.E 170 million approximately estimated at the end of 1992. The estimation could be reaching L.E 252.00 million at the end of 1998 in addition to EUROCEB claim for extending the Contract execution period by 18 month requesting to be paid L.E 1.5 million against each of every month of this extension amounting a total of L.E 27 million, the matter which would be raising the Claims to be :-

L.E 45.50 million (Dues) + L.E 27.00 million (Extension of time) + L.E 252.00 million (Claims) totalling more than L.E 300.00 million.

12-3-3 The release of all the guarantee bonds submitted by EUROCEB in regard of all the different parts of the Project.

12-4 The Employer's Counterclaims & Disputes

12-4-1 Ordinary Portland Cement, steel Reinforcement Grde 52 And 37 Incorporated in the Works.

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The Employer maintained that the cement and the reinforcing steel utilized by the Contractor in constructing the houses and offices of the Employer / Engineer and the temporary diaphragm wall were not complying with the requirements of the Technical Specifications and therefore the Contractor should reimburse to the Employer the difference in price between the materials utilized and the materials specified.

12-4-2 Availability of Cement on site the Employer alleged that the cement should have been delivered to the site in sealed bags and not in bulk.

12-4-3 Plastic concrete panels out of Specifications.

12-4-4 Formwork and shuttering out of Specifications.

12-4-5 Redecoration and paints.

12-4-6 Establishment of stores on site for electromechanical equipment.

12-4-7 Insurance for electromechanical equipment at Egyptian Insurance Companies.

12-4-8 Custom duties and custom clearance.

The Employer submitted his counter claims to the arbitration Tribunal who had instructed the Contractor to reply on these issues. Then the process and procedures of Arbitration had followed held three times in Egypt and two times in London without any troubles or problems.

12-5 The position of the Ministry in the above respect toward the Arbitration is as follows :-

- 12-5-1 The Employer had submitted Counter Claims approximately amounted L.E 17.00 million and this amount had been deducted from the Contractor till the arbitral Tribunal tells its word and judge.**
- 12-5-2 EUROCEB had been considered late in the execution of the project and consequently all its pending dues had been suspended against the relevant liquidated damages which had been estimated by L.E 37 million.**
- 12-5-3 The Employer together with his lawyer had prepared the required full defence and reply on the Contractor's different claims trying that the Arbitral Tribunal would refuse all or part of these claims.**
- 12-5-4 In regard of the project execution, the Ministry had no other certain claims as the project had been carried out perfectly, the substantial completion certificates had been issued and the remaining Maintenance Period Certificates follow according to the provision of the Contract.**

13- The Amicable Solution

While the Arbitration was proceeding between the EUROCEB as claimant and Employer as respondent or defendant in the case of the Contractor's claims and the vice versa in the case of the Employer's counterclaims in the arbitration case no. 39/93, the two parties had agreed to meet trying to find out an amicable Solution to the issue of all the claimed disputes. After prolonged discussions and holding many meetings, they had been able to reach the purposed amicable Solution agreement.

The agreement had been arrived at and initially signed on. 3/5 /1998 by a committee presented by nine members from the Ministry side and three members from the Contractor side.

According to this agreement the Employer would pay a lump sum amount of L.E 78.0 million to the Contractor against the complete cover and settlement of the whole dues, claims and counter claims according to the following initial agreement (minutes of meeting).

“ On 3.5.1998, a meeting took place in the Ministry of Public Works and Water Resources between the Ministry's experts and the representatives of the EUROCEB Consortium. The purpose of the meeting was to discuss the settlement of the disputes pending between the two parties in relation to the Esna Barrage Project and which is the object of the arbitration case No.39/93.

After discussion the two parties have reached an agreement to settle for a total Lump sum amount of L.E 78.000 (Seventy eight million Egyptian Pounds) covering dues, claims and counterclaims.

This agreement is subject to the approval by the Minister of M.O.P.W & W.R and to the signature between the parties of a final settlement detailed agreement. It is understood by both parties that once this agreement has fulfilled all necessary approvals, it will result in ending the pending arbitration in the case No. 39/93 mutual agreement ”.

The above referred to L.S amount of L.E 78.00 million is including the following items :-

- a) L.E 45.5 million dues to EUROCEB against works had been completed since 1993 and this amount is subject to the accountant revisions according to the documents and terms of the Contract.**
- b) L.E 32.50 million paid for the final comprehensive settlement of the EUROCEB claims (L.E 252.0 million) and after deducting the dues and counter claims of the Ministry which had been estimated by L.E 17.00 million. The referred to L.E 32.50 million represents 13% of the total amount claimed by EUROCEB (L.E 252.0 million) and 5% of the Contractor's cost.**

Final Agreement in details has been prepared on the aforementioned basis and principles and approved and inialized from both parties.

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14- Conclusion

14-1 EDIPCO Man Power Staff

The EDIPCO man power staff who had been assigned the duty of civil works of New Esna Barrage and Power Plant project is estimated hereinafter in manmonths.

- Consultant Resident Engineer & his Deputy	193 manmonth
- Engineer of Experience above 15 year	485 manmonth
- Engineer of Experience from 10 - 15 years	333 manmonth
- Engineer of Experience from 5 - 10 years	797 manmonth
- Director of Finance & Director of Administration	159 manmonth
- Accountants & Administrators	300 manmonth
- Clerks & Secretaries	120 manmonth
- Drivers	527 manmonth

The most senior staff member who had been involved in and in charge of these civil works are summerized as follows :-

- Eng. Ezz El Din Awadalla, the Chairman of EDIPCO together with the Coordinator and Designers staff members at Cairo.
- Eng. M. Abdel Meguid Osman, the Consultant Resident Engineer together with his Deputy Eng. For Civil Works M. Ali Sayed Ahmed at Esna. Their manmonths had reached 193 manmonth.
- Professor Doctor Abo El Eid - had been assigned the Consultancy duty of soilmechanics & Foundation, Dewatering & Geotechnical investigations works.
- Professor Doctor Ali Abdel Rahman – had been assigned the Consultancy duty of checking & revising the Design of Reinforced concrete works.
- Professor Doctor Emad Hamdy – had been assigned the Consultancy duty of the Hydraulic and Model Testing Works.
- Professor Doctor El Nahhas – had been assigned the Consultancy duty of the Design and construction of Plastic Concrete Temporary and Permanent Diaphragm Walls works.

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14-2 Proper Administration of the Contract On The Part
Of The Engineer / Employer

The Engineer and the Employer had followed the fundamental principles of the Contract properly and in a very good faith. The Engineer had competently supervised the works and fairly administered the Contract taking care that the works had been properly performed by the Contractor to the required standard and that the Contractor timely received the certificates of payments due to him under the Contract in spite of the fact that the works of this project were having a very composite nature which had required an infinite number of designing, planning, construction activities and the mobilization of considerable infrastructures, technical and financial resources.

In addition to the very big numbers of the Civil design drawings and workshop drawings which had been timely checked and revised by the Engineer to the extent that there had not been any delay in the execution of the different parts of the project.

There had been a high degree of cooperation between Engineer & Employer in processing and solving all the technical, administrative, financial problems and difficulties encountered during the performance of the Contract whilst maintaining the respective rights, duties and responsibilities.

Also a proper and timely application of the terms of the Contract.

Prompt examination, processing, discussion and approval of the technical and / or economical proposals of the Contractor

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in respect of design, variations, drawings, evaluations, methods, planning and execution of the works.

So, we hope that the conduct of the Esna Contract on the part of the Engineer had been characterized by proper and efficient administration and supervision which had accelerated the work and reached a good standard of work to the satisfaction of the Employer.

Yours Faithfully

Eng. Moh. Abdel Meguid Osman

Moh. Abdel Meguid 31/1/99

Consultant Resident Engineer

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ANNEXES

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15- Annexes

15-1 Annex 1 :- General Description Of The Project

The New Esna Barrage and Power Project Comprises :-

15-1-1 A Navigation Lock

Situated on the Left bank, with a useful length of 160m, width of 17m and draught of 3m. The lock is equipped with upstream and downstream mitre gates.

The lock chamber is filled and emptied by lateral aqueducts and openings at the lock floor level. With these arrangements, the total lock cycle will be around 25 minutes.

The structure consists of blocks which are self-stabilising, even in the event of complete lock emptying with the gates or upstream and downstream stoplogs closed.

The lock is located upstream of the road (high way viaduct approach) crossing the Nile via the power plant, spillway and closure dam. This road crosses the lock by means of a high bascule bridge.

Boat entry and exit operations are facilitated by upstream and downstream guide walls and by waiting areas.

15-1-2 A Power Plant

The power plant is 92m long, 59.50m wide and is divided into three blocks, each including two units separated by expansion joints. An assembly bay for

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equipment erection is located on the left hand side of the power plant.

The proposed units are of the bulb type with horizontal Kaplan-type turbine runner and horizontal-axis generator totally enclosed in a bulb casing. This casing is located upstream of the turbine runner and submerged in the water stream.

The power plant is of the outdoor type, with two outside gantry cranes for main handling, spanning the power plant from the upstream side to the downstream bulkhead gate grooves.

For erection, the heaviest parts of the units are accessible :-

- Through the open chamber above the generator casing.
- Through the turbine runner pit.

There are six units with a runner diameter of 6.25m and 16.80 MVA generators. The energy is transferred to the network through a direct 132 kV double circuit overhead line to a new switchgear and after to the existing Esna substation.

The electromechanical equipment for the plant also includes the trash rake, gates, stoplogs and handling equipment, electrical and control / monitoring systems as well as auxiliary mechanical equipment.

15-1-3 A Spillway

A spillway which maintains the normal pool level at 79.00m and allows an exceptional flood of 7000 m³/s, i.e 605 Mm³/day to pass with a maximum upstream level of 79.53m.

The spillway is separated from the power plant by a dividing pier which channels the water upstream and downstream of the structure.

Its dimensions are : length 173m and width 35m. The structure comprises eleven bays equipped with 12m wide radial gates. The radial gates installed in the outer bays are provided with overspill flap gates to enable floating debris to be disposed of. Expansion joints situated in the piers divide the structure into six blocks.

Each bay is provided with stoplog grooves. The upstream and downstream stoplog sections are handled by the power plant gantry cranes, whose tracks are extended along the entire length of the spillway.

The road bridge situated downstream of the radial gates is supported by the piers, which are extended beyond the center line of the gate axes.

The main structure, 35m wide, is extended by a 40m stilling basin, in which most of the energy dissipation downstream of the sill takes place.

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15-1-4 A Compacted Pit Run Gravel Closure Dam

A compacted pit run gravel closure dam completed the river closure. This closure dam is therefore located on the right bank in the deepest section of the river, which was used for navigation and along which all the river flow was passing during the construction phase.

Construction of the closure was undertaken as soon as the cofferdam was removed and flow diverted over the spillway and this necessitated first of all the construction of the closure dam embankment.

Finally, protective rip-rap was placed over the surface of the Closure Dam, while water tightness of the compacted pit run gravel embankment is ensured by the construction of a plastic diaphragm wall extending into the foundation layers as far as the impermeable horizon.

The plastic diaphragm wall is also extended under the concrete structures (spillway, power plant and Navigation Lock) to protect them against under seepage.

Moreover, the scheme included :-

- A new switchyard and the connection with the existing substation.
- A road running over the structure and connecting the Cairo-Aswan road on the right bank with the riverside road on the left bank.
- Rip-rap bank protection.
- Service building and housing.

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- Navigation facilities on the existing Esna Lock, etc.

The Contract Concerns the Civil, Electrical and Mechanical works for the New Esna barrage and power project as briefly described hereabove, and included also:-

- The temporary works (cofferdam, dewatering).
- The additional geotechnical investigation and the detailed analysis of the findings.
- The detailed design according to the updated geotechnical data and hydraulic model tests.
- The working drawings for all the Civil works and manufactured equipment.

15-1-5 General Layout Of The Project.

15-1-6 Closure Dam As Per Contract.

15-1-7 Closure Dam As Per Executed Solution.

7/1

15-2 Annex 2 :- Materials, Equipment & Volume Of Some
Important Items Used in the Project Civil Works

15-2-1 Materials

Ordinary Cement	21066	ton
White Cement	25	ton
Cement Type 11	101863	ton
Steel Grade (52)	126	ton
Steel Grade (37)	920	ton
Steel Grade (60)	26888	ton
Structural steel	1029	ton
Solar	19838402	Litre
Benzene	1593572	Litre

72

Oil consumption	766846	Litre
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(Lubricating & greasing)

Light electricity	9993739	KWH
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Power moving electricity	23167	KWH
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15-2-2 EQUIPMENT

- Total equipment used in the project Civil works by IMPREGILO – COGEFAR Company are tabulated hereinafter (Table 1,2,&3).
- Total equipment used in the project Civil works by RODIO Company are tabulated herewith (Table 4).
- Total equipment used in the project Civil works by Canal Harbour & Great Projects Company are tabulated herewith (Table 5).

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TOTAL EQUIPMENT IMPREGILO - COGEFAR		
ON SITE DURING THE CONSTRUCTION PERIOD		
SUMMARY REPORT		
QTY	DESCRIPTION	MODEL
1	Agric. Tractor RENAULT	851
2	Air Compressor ING. RAND	SSRML 150
3	Air Compressor ING. RAND	175 WD
1	Air Compressor ING. RAND	ML 90
1	Air Compressor ING. RAND	DXL 900
1	Ambulance EL TRAMCO	
2	Ambulance TOYOTA	HIACE
2	Back Hoe Excavator O&K	RH 9
2	Bulldozer CAT.	D 6 D
1	Bulldozer CAT.	D 8 K
1	Caterpillar Excavator	225
1	Cement Silo 885 CM capacity	LB 7
1	Centr. Elect. Pump	HT 40/5
1	Centr. Elect. Pump	1.5 KW
1	Centr. Elect. Pump	15 HP
1	Centr. Elect. Pump	HT 40/5
3	Centr. Elect. Pump 11 KW	NT 65
2	Centr. Elect. Pump 45 KW	ETANORM
1	Centr. Elect. Pump 75 KW	NT 65
1	Centr. Elect. Water Pump	NT 25/16
2	Compactor BITELLI	TOANADO
1	Control panel in 4 sections	
2	Mixer TYPE 1000 SRY	CIFA
4	Dumper ASTRA 20 TON	BM 21 FE
9	Dumper PERLINI 36 TON	DP 366
21	Elect. Pump Deep Weel	RITZ
2	Elect. Weld FIMEA 400A	
14	Elect. Weld. REMASALD	400 A

TOTAL EQUIPMENT IMPREGILO - COGEFAR		
ON SITE DURING THE CONSTRUCTION PERIOD		
SUMMARY REPORT		
QTY	DESCRIPTION	MODEL
2	Elect. Weld. REMASALD	500 A
4	FIAT 128 1300	SEDAN
13	FIAT 128 1300 (M.O.I)	SEDAN
1	FIAT ARGENTA (CAIRO)	855
1	FIAT ARGENTA 1600 (CAIRO)	855
1	FIAT CROMA 2000 cc	
3	FIAT ARGENTA 1600 (M.O.I)	855
1	FIAT Bed 30 TON	30 TN
2	FLYGT PUMP 13.5 KW	HS 3152
4	FLYGT PUMP 20 KW	BS 2151
2	FLYGT PUMP 3.1 KW	DP 3102
2	FLYGT PUMP 3.8 KW	DS 3080
2	FLYGT PUMP 54 KW	BS 2250
4	FLYGT PUMP 5.5 KW	DS 3080
1	Fork LIR 3 TON FIAT OM	DI - 30
1	Generator 120 KVA	G 10
2	Generator spark 57 KVA	TREVISIO
1	Generator 1500 KVA	ORABI
3	Generator FIAT AIFO 300 KVA	8281 SRI
1	Generator G.M. 750 KVA	

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**TOTAL EQUIPMENT IMPREGILO - COGEFAR
ON SITE DURING THE CONSTRUCTION PERIOD**

SUMMARY REPORT

QTY	DESCRIPTION	MODEL
3	Generator Perkins 325 KVA	B 9300
1	Hand Compactor DYNAFAC	LP 75 H
2	Hand Held Compactor DYNAPAC	LG 200
1	Hycro Rough Terrain Crane 30 TON	RT 121
1	Hydraulic Crane 12 TON BENDINI	12 TN
1	Low Loader 60 TON BERTOJA	60 TN
1	Maintenance Truck Magirus	130/12
4	Minibus TOYOTA 15 seats	HIACE
7	Minibus TOYOTA 15 seats (M. O. I.)	HIACE
1	Motor pump 303 HP	KS 200
2	Motor w/MERCURY 25 HP	
2	Motorgrader O & K	G 16
8	Pneumatic external vibrator	AB 400
9	Pick up BEDFORD 1600	KB 26
3	Pick up BEDFORD 1600 (M. O. I.)	KB 26
1	Pick up CHEVROLET 1600	1990
1	Polonez 1600 (CAIRO)	
3	Polonez 1600 (M.O. I.)	
1	Ripper RECO D8K	30 DSM
1	Tank ASTRA 15000 LIT.	BM 21 F
1	Tower BENCINI Light 4000 W	ML 4000
2	Tower BENCINI Light 6000 W	ML 6000
4	Tower crane RICHIER	GT 1425
3	Tower crane RICHIER	GT 1427
3	TOYOTA LAND CRUISER	
3	TOYOTA COROLLA	S/N EE 90
1	TOYOTA CRESSIDA	
4	Tractor ASTRA	BM 21 F

TOTAL EQUIPMENT IMPREGILO - COGEFAR		
ON SITE DURING THE CONSTRUCTION PERIOD		
SUMMARY REPORT		
QTY	DESCRIPTION	MODEL
2	Tractor CAT. 824C	3406
1	Trailer 2 Axle CIMA	RA 2 DM
1	Truck Crane 52 TON LINK BELT	HC 108
1	Truck FIAT 160 NC	
1	Truck FIAT 682 IVECD	
1	Truck MAGIRUS 1700	
5	Truck Mixer 9 MC ASTRA	BM 21 FE
2	Truck Mixer 9 MC FIAT	PC 300
1	Truck Refriger. BEDFORD	NPR-3 T
1	Truck with Crane and Comp. FIAT	682 N 3
1	Truck with Crane ASTRA 3 TN	BM 21 FM
2	Water Tank ASTRA 20000 LT	BM 21 FM
13	WEDA PUMP	
2	Wheel Loader CAT.	988B
1	Wheel Loader CAT.	930
1	Wheel Loader CAT.	966C
2	Pick up TOYOTA	III - LUX

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CONTRACTOR'S INSTALLATIONS	
ON SITE DURING THE CONSTRUCTION PERIOD	
SUMMARY REPORT	
QTY	DESCRIPTION
1	BATCHING PLANT CIFA
1	BATCHING PLANT ELBA
1	PRIMARY SCREENING PLANT
1	SECONDARY & WASHING SCREENING PLANT
1	STEEL YARD
1	JOINERY WORKSHOP
1	PRECAST YARD
2	BASCULE
1	FUEL DEPOT
1	WAREHOUSE
1	WORKSHOP

Table (4)

TOTAL EQUIPMENT RODIO		
ON SITE DURING THE CONSTRUCTION PERIOD		
SUMMARY REPORT		
QTY	DESCRIPTION	MODEL
1	Crawler Crane 150 TON (Link Belt Model 518)	518
1	Crawler Crane 30 TON (P & H 330)	330
1	Crawler Crane 70 TON (P & H 670)	670
3	Grab CASAGRANDE (with jaws and shields 800 and 1000mm thickness)	K 3000
2	Machanical grabs	
1	Complete mono-vibrators (KELLER Type)	
2	Power pack CASAGRANDE	K 150
2	Hydraulic hose winder	RP 6
2	Bentonite batching plant mission mud hopper	
1	Gantry crane for bentonite batching plant	
6	Bentonite agitator FLYGT	4551
5	Pump FLUGT	2151
5	Pump FLUGT	2051
5	Pump MORO	1200
5	Pump VARISCO	100
2	Desander unit SOTRESS	100
2	Set of funnel and tremie pipes for concr.	
2	Laboratory press with accessories for permeability tests	
1	Various laboratory equipment	
2	portable generator welding machine HOBART	4063
1	Fork lift O & K 3.5 TON Excavation and Concreting Ancillaries	

V 1

TOTAL EQUIPMENT CANAL HARBOUR & GREAT PROJECTS		
ON SITE DURING THE CONSTRUCTION PERIOD		
SUMMARY REPORT		
QTY	DESCRIPTION	MODEL
1	Dredger " Moustafa Mounir "	3500 HP
1	Tug boat multicut HARVEGE 6	
1	Payloader O & K	L 37
1	Somitomo Crane	
1	Car ISUZU	
1	P & H Crane	
50	Support pontoon	
1500	Mt Floating pipes D : 60 cm	

[Handwritten signature]

VC

15-3 Volume Of Some Important Items :-

Excavation inside cofferdam	2329888.4	m³
Excavation outside cofferdam	3535632.7	m³
Blinding concrete	5376.28	m³
Reinforced concrete	298671.95	m³
Additives :-		
a- Water reducing admixture	493162.89	Kg
b- Retarding admixture	739744.32	Kg
c- Non shrinkage admixture	746.99	Kg
Plastic concrete	35870.75	m³
Concreting under Bentonitic mud	36000.45	m³
(with plastic concrete)	V Y	

Concreting in the key trench	2784.898	m ³
(with plastic concrete)		
Formwork (different types)	226753.74	m ²
Waterstop	1963.67	L.M
Expansion joint filler	19518.10	m ²
Rip Rap (Type A)	75815.23	m ³
Rip Rap (Type B)	52353.51	m ³
Rip Rap (Type C)	40805.99	m ³
Pit run gravel for embankment (in dry)	315617.63	m ³
Pit run gravel for embankment (under water)	334267.56	m ³
Transition Layers :-		
Type T1	6980.58	m ³
Type T2	8004.43	m ³

Type T3	67915.60	m ³
Unwoven fabric filter in dry (different types)	63001.61	m ²
Unwoven fabric filter under water	34811.55	m ²
(different types)		
Asphalt pavement on base course	73674.24	m ²
Rockfill + scour protection	99698.83	m ³

VO

UPSTREAM

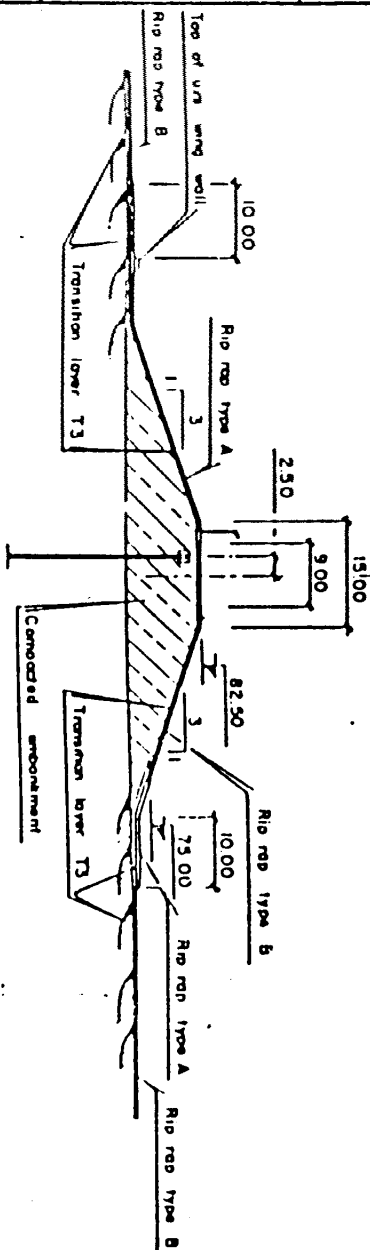
0 5 10 15 20 25 m

EUROPEAN CONSORTIUM FOR

Signature

CLOSURE DAM SECTION BETWEEN U/S WING WALL AND COFFERDAM

0 5 10 15 20 25 m



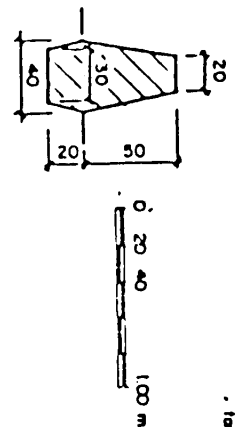
ROADWAY

TYPICAL CROSS SECTION IN CLOSURE DAM

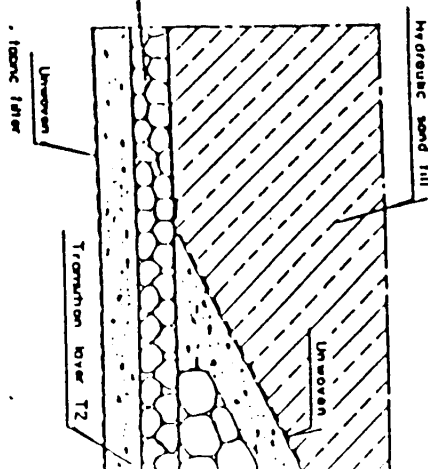
0 100 250 m

0 5 10 15 20 25 m

0 5 10 15 20 25 m



DETAIL 3

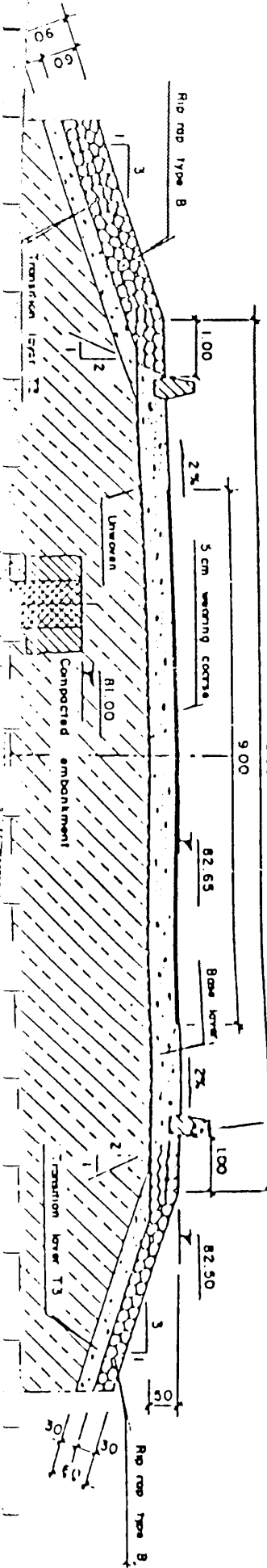
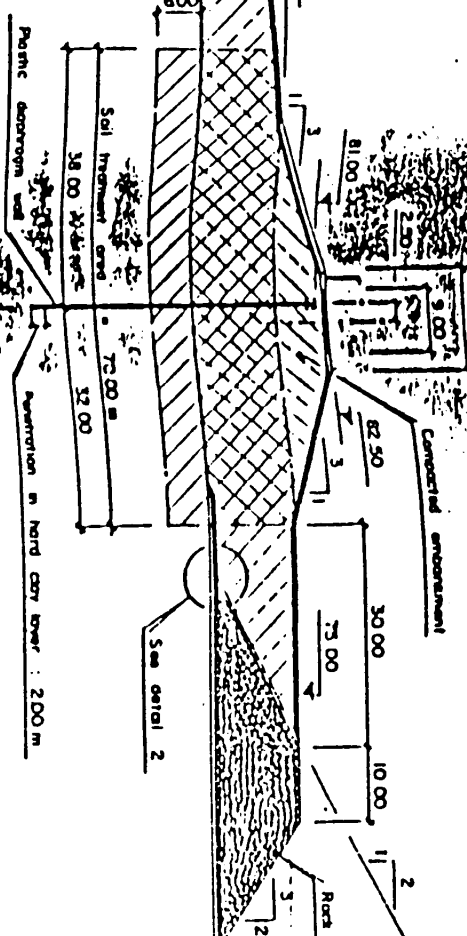


DETAIL 2

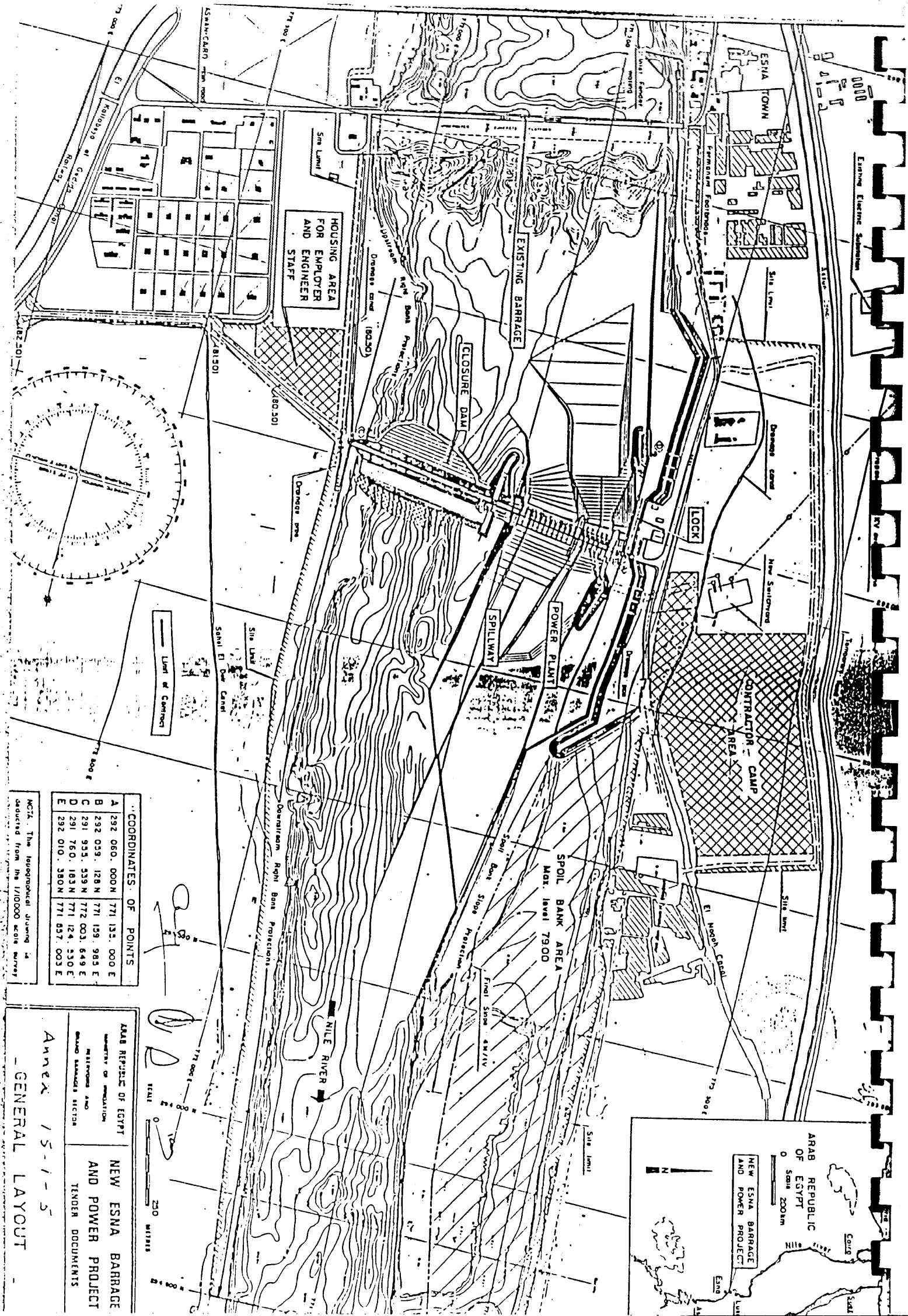
0 50 100 250 m

DETAIL 1

0 50 100 250 m



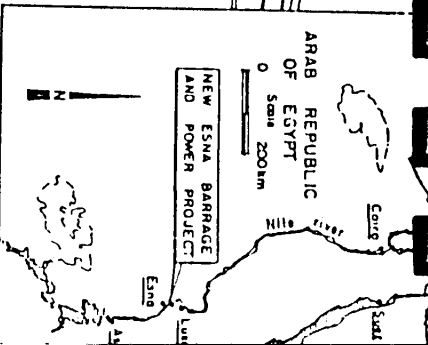
ARAB REPUBLIC OF EGYPT	NEW
MINISTRY OF IRRIGATION	AND
DESIGNING AND	TECHNICAL
STUDY AND DESIGN SECTION	
Annex 15-1	
CLOSURE	
SOGREAH	AMMAN
100000	1:1
DATE	DATE



COORDINATES OF POINTS

A	292 060. 000N	771 131. 000 E
B	292 059. 128 N	771 129. 985 E
C	291 955. 539 N	772 003. 649 E
D	291 760. 183 N	771 124. 230 E
E	292 010. 380N	771 057. 003 E

NOTE: The topographical drawing is deduced from the 1/10000 scale survey



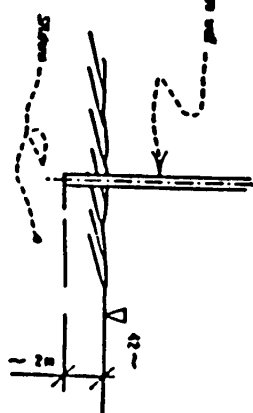
ARAB REPUBLIC OF EGYPT
MINISTRY OF IRRIGATION
IRRIGATION AND
DRAINAGE DIVISION
TENDER DOCUMENTS

Annex 15-1-5
GENERAL LAYOUT

77

[illegible]

0 1 2 3 4 5 6 7 8 9 10

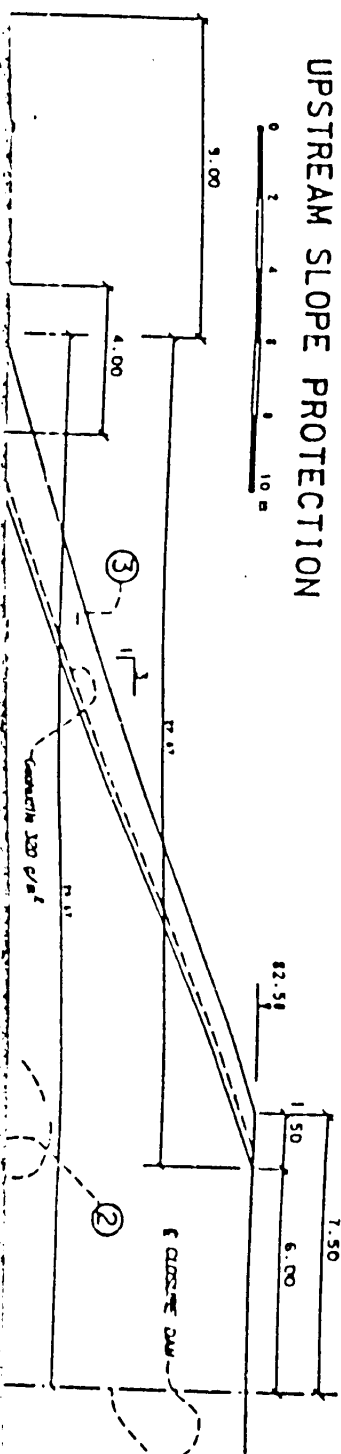


- ① *Am. Gun El Dair* (upward) - aimed \angle EOD min
- ② *Am. Gun El Dair* (upward - aimed) \angle EOD min aimed with EOD at \angle 5 min (freshmen)
- ③ *Am. Gun El Dair* (upward - aimed) \angle EOD min aimed in close fire (aimless) with vibrating rifle. Aim & shots same as above for EOD.

400 - show the steps during course

NOV 20 1964

Expenditures from 1900 to 1901



Annex 15

[illegible]

of the


CLOSURE DAM
TYPICAL SECTIONS

ARAB REPUBLIC OF

KEY ESMA BARPAGE AND

**EUROCE
EUROPEAN CONSORTIUM FOR**

LUNARIS: 1960-1961, 1962-1963, 1964-1965, 1966-1967, 1968-1969, 1970-1971, 1972-1973, 1974-1975, 1976-1977, 1978-1979, 1980-1981, 1982-1983, 1984-1985, 1986-1987, 1988-1989, 1990-1991, 1992-1993, 1994-1995, 1996-1997, 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013, 2014-2015, 2016-2017, 2018-2019, 2020-2021, 2022-2023, 2024-2025, 2026-2027, 2028-2029, 2030-2031, 2032-2033, 2034-2035, 2036-2037, 2038-2039, 2040-2041, 2042-2043, 2044-2045, 2046-2047, 2048-2049, 2050-2051, 2052-2053, 2054-2055, 2056-2057, 2058-2059, 2060-2061, 2062-2063, 2064-2065, 2066-2067, 2068-2069, 2070-2071, 2072-2073, 2074-2075, 2076-2077, 2078-2079, 2080-2081, 2082-2083, 2084-2085, 2086-2087, 2088-2089, 2090-2091, 2092-2093, 2094-2095, 2096-2097, 2098-2099, 2100-2101, 2102-2103, 2104-2105, 2106-2107, 2108-2109, 2110-2111, 2112-2113, 2114-2115, 2116-2117, 2118-2119, 2120-2121, 2122-2123, 2124-2125, 2126-2127, 2128-2129, 2130-2131, 2132-2133, 2134-2135, 2136-2137, 2138-2139, 2140-2141, 2142-2143, 2144-2145, 2146-2147, 2148-2149, 2150-2151, 2152-2153, 2154-2155, 2156-2157, 2158-2159, 2160-2161, 2162-2163, 2164-2165, 2166-2167, 2168-2169, 2170-2171, 2172-2173, 2174-2175, 2176-2177, 2178-2179, 2180-2181, 2182-2183, 2184-2185, 2186-2187, 2188-2189, 2190-2191, 2192-2193, 2194-2195, 2196-2197, 2198-2199, 2200-2201, 2202-2203, 2204-2205, 2206-2207, 2208-2209, 2210-2211, 2212-2213, 2214-2215, 2216-2217, 2218-2219, 2220-2221, 2222-2223, 2224-2225, 2226-2227, 2228-2229, 2230-2231, 2232-2233, 2234-2235, 2236-2237, 2238-2239, 2240-2241, 2242-2243, 2244-2245, 2246-2247, 2248-2249, 2250-2251, 2252-2253, 2254-2255, 2256-2257, 2258-2259, 2260-2261, 2262-2263, 2264-2265, 2266-2267, 2268-2269, 2270-2271, 2272-2273, 2274-2275, 2276-2277, 2278-2279, 2280-2281, 2282-2283, 2284-2285, 2286-2287, 2288-2289, 2290-2291, 2292-2293, 2294-2295, 2296-2297, 2298-2299, 2300-2301, 2302-2303, 2304-2305, 2306-2307, 2308-2309, 2310-2311, 2312-2313, 2314-2315, 2316-2317, 2318-2319, 2320-2321, 2322-2323, 2324-2325, 2326-2327, 2328-2329, 2330-2331, 2332-2333, 2334-2335, 2336-2337, 2338-2339, 2340-2341, 2342-2343, 2344-2345, 2346-2347, 2348-2349, 2350-2351, 2352-2353, 2354-2355, 2356-2357, 2358-2359, 2360-2361, 2362-2363, 2364-2365, 2366-2367, 2368-2369, 2370-2371, 2372-2373, 2374-2375, 2376-2377, 2378-2379, 2380-2381, 2382-2383, 2384-2385, 2386-2387, 2388-2389, 2390-2391, 2392-2393, 2394-2395, 2396-2397, 2398-2399, 2400-2401, 2402-2403, 2404-2405, 2406-2407, 2408-2409, 2410-2411, 2412-2413, 2414-2415, 2416-2417, 2418-2419, 2420-2421, 2422-2423, 2424-2425, 2426-2427, 2428-2429, 2430-2431, 2432-2433, 2434-2435, 2436-2437, 2438-2439, 2440-2441, 2442-2443, 2444-2445, 2446-2447, 2448-2449, 2450-2451, 2452-2453, 2454-2455, 2456-2457, 2458-2459, 2460-2461, 2462-2463, 2464-2465, 2466-2467, 2468-2469, 2470-2471, 2472-2473, 2474-2475, 2476-2477, 2478-2479, 2480-2481, 2482-2483, 2484-2485, 2486-2487, 2488-2489, 2490-2491, 2492-2493, 2494-2495, 2496-2497, 2498-2499, 2500-2501, 2502-2503, 2504-2505, 2506-2507, 2508-2509, 2510-2511, 2512-2513, 2514-2515, 2516-2517, 2518-2519, 2520-2521, 2522-2523, 2524-2525, 2526-2527, 2528-2529, 2530-2531, 2532-2533, 2534-2535, 2536-2537, 2538-2539, 2540-2541, 2542-2543, 2544-2545, 2546-2547, 2548-2549, 2550-2551, 2552-2553, 2554-2555, 2556-2557, 2558-2559, 2560-2561, 2562-2563, 2564-2565, 2566-2567, 2568-2569, 2570-2571, 2572-2573, 2574-2575, 2576-2577, 2578-2579, 2580-2581, 2582-2583, 2584-2585, 2586-2587, 2588-2589, 2590-2591, 2592-2593, 2594-2595, 2596-2597, 2598-2599, 2600-2601, 2602-2603, 2604-2605, 2606-2607, 2608-2609, 2610-2611, 2612-2613, 2614-2615, 2616-2617, 2618-2619, 2620-2621, 2622-2623, 2624-2625, 2626-2627, 2628-2629, 2630-2631, 2632-2633, 2634-2635, 2636-2637, 2638-2639, 2640-2641, 2642-2643, 2644-2645, 2646-2647, 2648-2649, 2650-2651, 2652-2653, 2654-2655, 2656-2657, 2658-2659, 2660-2661, 2662-2663, 2664-2665, 2666-2667, 2668-2669, 2670-2671, 2672-2673, 2674-2675, 2676-2677, 2678-2679, 2680-2681, 2682-2683, 2684-2685, 2686-2687, 2688-2689, 2690-2691, 2692-2693, 2694-2695, 2696-2697, 2698-2699, 2700-2701, 2702-


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7E. ~~CONFIDENTIAL~~